

CLAIMS

What is claimed is:

- 1 1. An integrated circuit (IC) comprising:
2 interface circuitry to interface the IC to a burn-in system, the interface circuitry to
3 receive at least one temperature value from the burn-in system and to send at least one
4 temperature indication to the burn-in system;
5 a storage circuit coupled to the interface circuitry to store the at least one
6 temperature value; and
7 a thermal sense circuit coupled to the interface circuitry to provide the at least one
8 temperature indication.
- 1 2. The IC recited in claim 1, wherein the at least one temperature value is a set-
2 point.
- 1 3. The IC recited in claim 1, wherein the at least one temperature indication is
2 proportional to the junction temperature of the IC.
- 1 4. An integrated circuit (IC) burn-in system comprising:
2 a computer system comprising a processor operating under the control of a
3 computer program; and
4 at least one IC comprising:
5 interface circuitry to interface the IC to the computer system; and
6 a thermal sense circuit, coupled to the interface circuitry, to provide a
7 temperature indication that is proportional to the junction temperature of the IC.
- 1 5. The IC burn-in system recited in claim 4, wherein the computer system compares
2 the temperature indication with a temperature value determined by the computer
3 program;

4 wherein if the temperature indication substantially matches the temperature value,
5 the computer system bins the IC at that temperature value; and

6 wherein if the temperature indication is less than the temperature value, the
7 computer system decrements the temperature value and compares the temperature
8 indication with the decremented temperature value.

1 6. The IC burn-in system recited in claim 4, wherein the IC further comprises:
2 logic circuitry coupled to the interface circuitry; and

3 wherein the logic circuitry is responsive to the temperature indication generated
4 by the thermal sense circuit;

5 wherein the logic circuit is also responsive to a temperature value generated by
6 the computer system as determined by the computer program;

7 wherein the logic circuitry compares the temperature indication with the
8 temperature value;

9 wherein if the temperature indication substantially matches the temperature value,
10 the logic circuitry generates a first indication to the computer system, and the computer
11 system bins the IC at that temperature value; and

12 wherein if the temperature indication is less than the temperature value, the logic
13 circuitry generates a second indication to the computer system, and the computer system
14 decrements the temperature value and compares the temperature indication with the
15 decremented temperature value.

1 7. A burn-in system for an IC comprising a thermal sense circuit, the burn-in system
2 comprising:

3 a fixture to electrically couple to the IC;

4 a temperature-altering mechanism to alter the ambient temperature of the IC; and

5 a data processing system coupled to the fixture, the data processing system
6 executing a computer program, the computer program operating the burn-in system to
7 characterize the IC and comprising the operations of:

8 storing a temperature value for the IC;

9 controlling the temperature-altering mechanism to thermally stress the IC;
 10 determining whether a temperature indication from the thermal sense circuit
 11 substantially matches the temperature value;
 12 if so, recording the temperature value; and
 13 if not, changing the temperature value to a new temperature value and
 14 determining whether the temperature indication matches the new temperature value.

1 8. The burn-in system recited in claim 7, wherein the computer program operating
 2 the burn-in system further comprises the operations of:
 3 determining whether the temperature indication matches the new temperature
 4 value;
 5 if so, recording the new temperature value;
 6 otherwise, repeatedly changing the temperature value and comparing the
 7 temperature indication with the changed temperature value, until the temperature
 8 indication matches the changed temperature value; and
 9 recording the changed temperature value.

1 9. The burn-in system recited in claim 7, wherein the temperature value is stored in
 2 a storage circuit in the IC.

1 10. The burn-in system recited in claim 7, wherein the temperature value is stored in
 2 a storage element in the data processing system.

1 11. A method of testing an integrated circuit (IC) comprising a plurality of electronic
 2 devices, one of which is to provide a temperature indication, the method comprising:
 3 storing a temperature value for the IC;
 4 thermally stressing the IC;
 5 the one electronic device providing a temperature indication;
 6 determining whether the temperature indication matches the temperature value;
 7 if so, recording the temperature value; and

8 if not, changing the temperature value to a new temperature value and
9 determining whether the temperature indication matches the new temperature value.

1 12. The method recited in claim 11 and further comprising;
2 if the temperature indication matches the new temperature value, recording the
3 temperature value;
4 otherwise, repeatedly changing the temperature value and comparing the
5 temperature indication with the changed temperature value, until the temperature
6 indication matches the changed temperature value; and
7 recording the changed temperature value.

1 13. The method recited in claim 11, wherein storing is performed by another one of
2 the plurality of electronic devices in the IC.

1 14. The method recited in claim 11, wherein storing is performed by a burn-in system
2 coupled to the IC and comprising a stored-program digital computer.

1 15. The method recited in claim 11, wherein the plurality of electronic devices
2 includes a logic circuit, and wherein determining is performed by the logic circuit.

1 16. The method recited in claim 11, wherein determining is performed by a burn-in
2 system coupled to the IC and comprising a stored-program digital computer.

1 17. A method of testing a plurality of integrated circuits (ICs), each comprising a
2 thermal sense circuit, the method comprising:
3 storing a temperature value for each IC;
4 thermally stressing the ICs;
5 each thermal sense circuit providing a temperature indication for its respective
6 IC;
7 determining whether the temperature indication matches the temperature value;

8 if so, recording the temperature value for the corresponding IC; and
9 if not, changing the temperature value to a new temperature value and
10 determining whether the temperature indication matches the new temperature value.

1 18. The method recited in claim 17 and further comprising;
2 if the temperature indication matches the new temperature value, recording the
3 temperature value for the corresponding IC;
4 otherwise, repeatedly changing the temperature value and comparing the
5 temperature indication with the changed temperature value, until the temperature
6 indication matches the changed temperature value; and
7 recording the changed temperature value for the respective IC.

1 19. The method recited in claim 17, wherein each IC comprises a storage circuit, and
2 wherein storing is performed by the storage circuit.

1 20. The method recited in claim 17, wherein storing is performed by a burn-in system
2 coupled to the IC and comprising a stored-program digital computer.

1 21. The method recited in claim 17, wherein each IC comprises a logic circuit, and
2 wherein determining is performed by the logic circuit.

1 22. The method recited in claim 17, wherein determining is performed by a burn-in
2 system coupled to the IC and comprising a stored-program digital computer.

1 23. A method of testing a plurality of electronic components, each comprising a
2 thermal sense circuit, the method comprising:
3 storing a temperature value for each electronic component;
4 thermally stressing the electronic components;
5 each thermal sense circuit providing a temperature indication for its respective
6 electronic component;

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1 30. A computer-readable medium containing computer instructions for instructing a
2 processor to perform a method of binning a plurality of ICs each having a thermal sense
3 circuit, the processor forming an element in a system comprising a temperature-altering
4 mechanism to thermally stress the ICs and a comparison mechanism, wherein the
5 instructions comprise:

6 storing a temperature value for each IC;
7 obtaining a temperature indication from the thermal sense circuit of each IC;
8 for each IC not yet binned, comparing the stored temperature value with the
9 temperature indication; and
10 if the temperature indication substantially matches the stored temperature value,
11 recording the temperature value;
12 otherwise, changing the temperature value to a new temperature value and
13 comparing the new temperature value with the temperature indication.

1 31. The computer-readable medium recited in claim 30, wherein the instructions
2 further comprise:

3 if the temperature indication substantially matches the new temperature value,
4 recording the new temperature value;
5 otherwise, repeatedly changing the temperature value and comparing the
6 temperature indication with the changed temperature value, until the temperature
7 indication substantially matches the changed temperature value, and recording the
8 changed temperature value.

1 32. The computer-readable medium recited in claim 30, wherein the instructions
2 further comprise:

3 determining an estimate of the burn-in time for each IC, using the particular
4 temperature value recorded for each IC.